polymer powder and organic fiber powder coating entire surface of the core material 2 in a constant thickness.

[Scope of Claim for Patent]

[Claim 1] An excrement-treatment material for pet being compressed granular body and having a two layer structure composed of a compressed core material formed from hydrophilic organic fibers, and a coating layer consisted of water absorbing polymer powder and organic fiber powder coating entire surface of the core material in a constant thickness.

[Claim 2] An excrement-treatment material for pet as set forth in claim 1, wherein a surface active agent is added to the compressed core material formed from hydrophilic organic fibers.

[Claim 3] An excrement-treatment material for pet as set forth in claim 1 or 2, wherein a PH indicator, such as a water soluble coloring pigment, aroma chemical, methylene blue and so forth is added to the core material or the coating layer.

[Claim 4] A production method of an excrement-treatment material for pet comprising steps of depositing water absorbing polymer powder and organic fiber powder on an entire surface of granular body palletized from hydrophilic organic fibers for forming a coating layer of substantially constant thickness, and forming into compressed granular body by rolling.

[Claim 5] A production method of an excrement-treatment material for pet as set forth in claim 4, wherein, in rolling,

compressed granular body is formed in swelled condition.

[Detailed Description of the Invention]

[0001]

[Technical Field in which Invention Belongs]

The present invention relates to an excrement-treatment material for pet used upon disposing excrement of small animals, such as cat, dog or the like, and a production method thereof.

[0002]

[Prior Art] As a method for easily disposing excrements discharged by small animals as pet bred mainly in a room, it has been taken a method to house a sheet form or granular excrement-treatment material formed for absorbing excrement, within an excrement container and to regularly exchange the excrement-treatment material.

[0003] The conventional excrement-treatment materials used herein are those formed into sheet form or granular form from highly water absorbing polymer, organic fibers, such as paper powder or wood flour or the like, water absorbing material, such as clay mineral or the like, and zeolite or activated charcoal (material for absorbing volatile material, such as odor or the like) with a binder, such as polyvinyl alcohol, carboxymethyl cellulose or hydroxyethyl cellulose or the like as thermoplastic resin.

[0004] Then, the excrement-treatment material has a function to absorb a given amount of liquid state excrement and further

volatile substance. Particularly, the excrement-treatment materials prepared from organic fibers, such as wood flour, paper powder or the like and the binder of water soluble thermoplastic resin have been widely used for convenience in handling for capability of thermal disposal or flushing in flush toilet.

[0005]

[Problem to be Solved by the Invention] However, in the conventional excrement-treatment material as set forth above, when primary materials of water absorbing material and the absorbing material for absorbing volatile material, such as odor or the like are organic materials, even when clay mineral or the like having relatively large specific gravity is contained for adjusting weight, bulk density is small as small as about 0.3 to 0.4.

[0006] Accordingly, in case of granular excrement-treatment material having diameter about 5 mm, it lacks static stability before absorbing liquid state excrement. As a result, when small animal walks thereon, the excrement-treatment material is disturbed or scattered out of the excrement container to possibly make impossible to expect practical absorbing effect upon excretion of small animal.

[0007] Furthermore, for restricting breakdown of the shape pf excrement-treatment material and achieving water absorbing effect, blending amount of the binder is restricted as small

as possible and a blending ratio of the water absorbing material is increased as much as possible. In this case, effect of binder in each individual product becomes lower and shape may be lost by accumulated moisture to stain the circumference. Accordingly, it has been difficult to absorb large amount of liquid state excrement of small animal with restricting loss of shape, and to improve water absorbing ability and cleanliness.

[0008]

[Means for Solving the Invention] The present invention is to solve the problem in the prior art set forth above and an object is to provide an excrement-treatment material achieving high shape stability and static stability and high water absorbing ability. A principle is an excrement-treatment material for pet being compressed granular body and having a two layer structure composed of a compressed core material formed from hydrophilic organic fibers, and a coating layer consisted of water absorbing polymer powder and organic fiber powder coating entire surface of the core material in a constant thickness, and production method thereof.

[0009]

[Mode of Implementation of Invention] Hereinafter, the present invention will be discussed in detail in terms of an embodiment shown on the drawings. In Fig. 1, the reference numeral 1 denotes an excrement-treatment material for pet according to the present invention, which is formed into circular or elliptic compressed

granular body in plan view and has external diameter of about 5 to 7 mm and thickness of about 2 mm.

[0010] The reference numeral 2 denotes compressed core material of circular or elliptic shape in plan view and substantially similar shape as the excrement-treatment material 1, and is formed from hydrophilic organic fibers, such as pulp slug, wood flour or the like. On the entire surface of the compressed core material 2, a coating layer 3 consisted of water absorbing polymer powder, such as polyvinyl alcohol, carboxymethyl cellulose or hydroxyethyl cellulose or the like and organic fibrous powder, such as paper powder, wood flour, peat moss powder, chaffy powder or the like, is formed with substantially constant thickness.

[0011] As set forth above, by forming the excrement-treatment material 1 into two layer structure of the core material 2 and the coating layer 3 having respectively different functions, high water absorbing ability can be expected and loss of shape is not caused even absorbing water to achieve high shape stability. Furthermore, by forming the granular body in compressed shape, static stability can be improved even in light weight. Also, since contact area between respective excrement-treatment material is large, internal penetration ability of moisture is achieved and transfer of moisture between granular bodies can be done quickly so ca not to cause excess of water retention capability to avoid occurrence of loss of shape in a part of the excrement-treatment material.

[0012] Next, the production method of the excrement-treatment material will be discussed hereinafter in detail in terms of embodiment illustrated in Figs. 2 to 4. At first, about 1 to 5 mm of hydrophilic organic fibers 12A, such as pulp slug, wood flour or the like preliminarily swelled to have moisture content of 10 to 70 % by weight, is charged to flat pelletizer or extruder to palletize granular core member 12 of about 0.5 to 10 mm in diameter.

[0013] In the palletizing step of the granular core member 12, scuffing 12B of organic fibers 12A as forming material and moisture content become important. Namely, with moisture content in the forming material, shape variation of organic fibers 12A is made adaptable to permit entangling of fibers and sequentially causing evaporation of moisture to maintain the palletized shape formed by entangling of the organic fibers.

[0014] On the other hand, scuffing 12B is to bond the granular core member 12 and the coating layer 13 covering the surface of the former and discussed later, therethrough for forming integral structure of the granular core member 12 and the coating layer 13, without admixing water absorbing polymer having adhesive property together with water retention referred to as so-called as binder.

[0015] Subsequently, the granular core member 12 is fed into a coating apparatus and a predetermined vibrational motion is applied to a working disc of the coating apparatus. By this,

the granular core member 12 moves along the working disc with causing autorotation on the working disc of the coating apparatus. Thus, the granular core member 12 is corrected the shape thereof and becomes substantially spherical granular body as shown in Fig. 2.

[0016] Furthermore, predetermined amounts of water absorbing polymer and paper powder are charged onto the working disc through separately provided supply holes. At a stage charging the water absorbing polymer and paper powder, water absorbing polymer and paper powder deposit on the surface of the granular core member 12 formed into substantially spherical granular body by vibrational motion of the working disc, and conjunction therewith, the coating layer 13 is compacted to be contact bonded on the surface of the granular core member 12 for forming integral structure of the granular core member 12 and the coating layer 13.

[0017] Here, respective supply holes of the water absorbing polymer and paper powder in the coating apparatus are designed to charge in the vicinity of the center of circle of the working disc. By this, water absorbing polymer powder and paper powder gradually propagate in moving direction of the granular core member 12 moving along the working disc with causing autorotation to be uniformly deposited over the entire surface. It should be noted that water absorbing polymer powder and paper powder may be in preliminarily mixed condition. In such case, the

mixture may be charged through one of two supply holes.

[0018] On the other hand, water absorbing polymer powder and paper powder is desirable to have constant dimensions as being mechanically crushed. In the shown embodiment, both having maximum diameter in a range of 50 to 300 mesh are used. Here, crushing is means for cutting polymer and paper powder into a constant dimension by mechanical operation to obtain the coating member avoiding scuffing particular to fibers of the paper powder. As a result, the coating layer 13 may be deposited on the granular core member 12 with a constant thickness and with high density, and the surface of the coating layer 13 can be formed smooth.

[0019] As set forth above, in the step of forming the granular core member, it is unnecessary to admix water absorbing polymer having adhesive property together with water retention referred to as so-called as binder to the forming material, and shape stabilization is achieved by forming material of the coating layer 13. Here, a blending ratio of forming material forming the coating layer 13 is to mix paper powder in a range of about 1 to 2 in weight ratio relative to water absorbing polymer powder 1. A total weight of coating layer 13 actually contact bonded is adjusted to be in a range of 10 to 40% relative to weight of the granular core member 12.

[0020] On the other hand, coating of water absorbing polymer powder and organic fiber powder relative to the granular core

member 12 is formed to coat the entire surface of the granular core member 12 uniformly and with constant thickness. As in the shown embodiment, assuming that diameter of the granular core member 12 is used in the extent of 0.5 to 10 mm, and diameter of the granular body after forming of the coating layer 13 is increase up to 2 to 13 mm.

[0021] Next, the granular body 14 is fed into a rotary type or vibration type drying chamber to uniformly dry respective individual granular body 14 with applying motion amount in the extent not to cause breakdown of the shape of the granular body 14 to the granular body 14. This drying is performed forma period of several minutes to several tens minutes by heating in the extent of 60 to 100 °C of room temperature until moisture content contained in the granular body 14 becomes 2 to 20 Wt%, desirably 5 to 15 Wt%.

[0022] By this heat-drying, moisture content of the granular body 14 is reduced to make the shape of the coating layer 13 stable. At the same time, diameter of the granular body 14 is reduced in the extent of 0.5 to 8 mm. After drying, granular body 14 is removed from the drying chamber to cool up to ambient temperature (normal temperature) by air drying using natural drying or air blower.

[0023] Subsequently, by a rolling apparatus, such as rotary roller or the like, the granular body 14 is rolled to form the compressed granular body 1A of substantially the same shape

and same size of the granular body 1 shown in Fig. 1. Upon rolling, rolling width (distance between rollers) is preferably 1 to 4 mm, and more preferably 1 to 2 mm. In this rolling process, entangling between organic fibers 12A forming the granular core body 14 can be slightly released to expand gaps between organic fibers 12A to obtain compressed granular body 1A with improved capillary effect.

[0024] It should be noted that, upon rolling process, since the granular body 14 is stilled maintained in wet condition (moisture content being about 5 to 15 Wt%), adhesive property of the water absorbing polymer as component of the coating layer 13 acts effectively to hardly cause cracking of the granular body 14 or peeling off of the coating layer 13 during rolling to permit formation of the compressed granular body 1A.

[0025] Finally, the compressed granular body 1A is maintained in static condition for hot air drying to adjust moisture content within a range of 5 to 10 Wt%. Subsequently, by leaving in atmosphere to cool down to normal temperature condition, objective excrement-treatment material 1 formed from compressed granular bodies can be obtained. Furthermore, it is further preferred by screening, those having oblateness of about 0.4 to 0.7 are selected to obtain a given quality obtainable of effect of compressed shape.

[0026] Next, upon use of the excrement-treatment material 1 according to the present invention, discussing based on the

results of experiments, at first, since the excrement-treatment material 1 obtained by the foregoing production method is compressed granular shape, it can be filled in the predetermined excrement container with restricting gap ratio in the container small. Comparing bulk density with the conventional substantially spherical granular body (here use of the granular body eliminated rolling process), it increases about 0.16 to 0.2.

[0027] On the other hand, organic fibers 12A forming the core member 2 is appropriately dissociated to be expected better capillary effect. Also, since it is formed in compressed shape, the surface area of each individual excrement-treatment material is enlarged to achieve better water permeability into inside of the excrement-treatment material, and transfer of moisture between the excrement-treatment material 1, 1 can be done quickly.

[0028] Namely, by water absorbing polymer forming the coating layer 3 and having high water holding property, moisture is quickly absorbed from the surface of the excrement-treatment material 1, and in conjunction therewith, moisture captured in the surface quickly penetrates inside pf the organic fibers 12A as component of the core member 2 by capillary phenomenon to be held therein. Moisture in excess of water holding capacity is easily transferred to other excrement-treatment material through the contact surfaces between mutually contacting

excrement-treatment material 1, 1. As a result, it can prevent occurrence of breakdown of shape of only part of excrement-treatment material 1 due to swelling of water absorbing layer 3 by poring of excess amount of water locally.

[0029] Furthermore, since the inner layer and the coating layer of the excrement-treatment material 1 are formed separately in consideration of properties thereof and binder, such as highly hydrophilic thermoplastic resin is not added to the core member 2 as the inner layer, breakdown upon holding a given amount of moisture is less possible in comparison with the case where the core member is formed from the mixture of the water absorbing material and binder. Furthermore, in case of disposing to toilet, by disposing the excrement-treatment material 1 into large amount of water, water absorbing polymer forming the coating layer 3 is swelled to quickly disperse the coating layer 3 into water. Then, since remaining core member 2 is aggregate body of organic fibers where binder is not present, to easily cause breakdown of shape to restrict plugging of piping.

[0030] Then, the foregoing discussion has been given that the excrement-absorbing material 1 achieves sufficient absorbing function up to inside, substantial water absorbing efficiency as compared with the case where the material before rolling is filled in similar container, and as measured weight of the granular body consumed as dripped 20 cc of water into the container, the consumed amount of the one before rolling was 11g whereas

the excrement-treatment material of the present invention was reduced down to 8g.

[0031] In the present invention, by adding small amount of surface active agent, such as nonionic surface active agent ("Sunmoline" manufactured by Sanyo Kasei Kabushiki Kaisha), enhancing permeating effect to the core member 2, as small as about 1 to 2 Wt%, hydrophobic property in low wet condition of organic fibers 12A can be restricted so that effective water absorption by core member 2 can be expected. Furthermore, by adding water soluble coloring pigment, aroma chemical, pH indicator, such as methylene blue or the like, and so on to the core member 2 or the coating layer 3 in the process of production, product with additional function can be provided.

[0032]

[Effect of the Invention] The excrement-treatment material according to the present invention is constructed with substantially 100% organic water absorbing material as set forth above, and by the construction separately forming the inner layer and the coating layer, the excrement-treatment material having high shape stability and water absorbing ability can be obtained without adding binder to the inner layer as the core member. By forming into compressed granular body, static stability becomes high, and filling factor into the excrement container can be enhanced to provide the product with which both of high water absorbing ability and good use feeling can

be expected upon use. On the other hand, incineration and flushing by large amount of water becomes possible. Upon disposing in general home, simple method, such as disposing to flushing toilet or incineration and so forth can be selected to permit sanitary handling after use.

[Brief Description of the Drawings]

[Fig. 1]

A longitudinal enlarged section of an excrement-treatment material for pet according to the present invention;

[Fig. 2]

An enlarged sectional explanatory illustration of a granular core member;

[Fig. 3]

An enlarged sectional explanatory illustration of a granular body; and

[Fig. 4]

An explanatory illustration of a rolling process.

[Explanation of Reference Numerals]

1 excrement-treatment material

1A compressed granular body

2 core member

3 coating layer

12 granular core member

12A organic fiber

12B scuffing

13 coating layer

14 granular body